Amendments to the Claims

This listing of claims will replace all prior versions, and listings of claims in the application.

1-74. (Cancelled)

75. (Currently Amended) An apparatus for down-converting an electromagnetic signal, comprising:

a capacitor having a first and second port;

a transistor having a source, gate and drain; and

a resonant structure having a first and second port,

wherein the first port of the capacitor is electrically coupled to the source or drain of the transistor, and the first port of the resonant structure is electrically coupled to the other of the source or drain of the transistor, and

wherein a control signal is electrically coupled ~~directly~~ to the gate of the transistor, and an RF source signal is electrically coupled to the first port of the resonant structure, and

wherein a value of capacitance for the capacitor is selected based on a frequency of energy transfer pulses, an aperture duration of the transistor, and a resistor value.

76. (Currently Amended) The apparatus of claim 75, wherein ~~a~~ the value of capacitance for the capacitor is selected so that the capacitor discharges stored energy to a load when the transistor is open.

77. (Currently Amended) The apparatus of claim 75, wherein a the value of capacitance (C_s) for the capacitor is selected ~~based on a frequency (*freqLO*) of energy transfer pulses, a duration (*Aperture_Width*) of an aperture of the transistor, and a resistance (*R*)~~ such that

$$C_s(R) = \left(\frac{\frac{1}{freqLO} - Aperture\_Width}{-\ln(0.841) \cdot R} \right)$$

wherein (*freqLO*) is the frequency of energy transfer pulses, (*Aperture_Width*) is the aperture duration of the transistor, and (*R*) is the resistor value.

78. (Previously Presented) The apparatus of claim 75, wherein a duration of an aperture of pulses of the control signal is nominally equal to one-half of a period of the RF source signal.

79. (Previously Presented) The apparatus of claim 75, wherein the first port of the capacitor is electrically coupled to an impedance matching network.

80. (Previously Presented) The apparatus of claim 75, wherein the first port of the capacitor is electrically coupled to an amplifier.

81. (Previously Presented) The apparatus of claim 75, wherein the first port of the resonant structure is electrically coupled to an impedance matching network.

82. (Cancelled)

83. (Previously Presented) The apparatus of claim 75, wherein the transistor is a FET.

84. (Previously Presented) The apparatus of claim 75, wherein the transistor is a JFET.

85. (Previously Presented) The apparatus of claim 75, wherein the transistor is a MOSFET.

86. (Currently Amended) An apparatus for down-converting an electromagnetic signal, comprising:

a first and second capacitor each having a first and second port;

a transistor having a source, gate and drain; and

a resonant structure having a first and second port,

wherein the first port of the first capacitor and the second port of the second capacitor are electrically coupled to one of the source or drain of the transistor, and the first port of the second capacitor and the first port of the resonant structure are electrically coupled to the other of the source or drain of the transistor,

wherein a control signal is electrically coupled ~~directly~~ to the gate of the transistor, and an RF source signal is electrically coupled to the first port of the resonant structure, and

wherein a value of capacitance for the first capacitor is selected based on a frequency of energy transfer pulses, an aperture duration of the transistor, and a resistor value.

87. (Currently Amended) The apparatus of claim 86, wherein ~~a~~ the value of capacitance for the first capacitor is selected so that the capacitor discharges stored energy to a load when the transistor is open.

88. (Currently Amended) The apparatus of claim 86, wherein ~~a~~ the value of capacitance (C_s) for the first capacitor is selected ~~based on a frequency (*freqLO*) of energy transfer pulses, a duration (*Aperture_Width*) of an aperture of the transistor, and a resistance (*R*)~~ such that

$$C_s(R) = \left(\frac{\frac{1}{freqLO} - Aperture\_Width}{-\ln(0.841) \cdot R} \right)$$

wherein (*freqLO*) is the frequency of energy transfer pulses, (*Aperture_Width*) is the aperture duration of the transistor, and (*R*) is the resistor value.

89. (Previously Presented) The apparatus of claim 86, wherein a duration of an aperture of pulses of the control signal is nominally equal to one-half of a period of the RF source signal.

90. (Previously Presented) The apparatus of claim 86, wherein the first port of the first capacitor is electrically coupled to an impedance matching network.

91. (Previously Presented) The apparatus of claim 86, wherein the first port of the first capacitor is electrically coupled to an amplifier.

92. (Previously Presented) The apparatus of claim 86, wherein the first port of the resonant structure is electrically coupled to an impedance matching network.

93. (Cancelled)

94. (Previously Presented) The apparatus of claim 86, wherein the transistor is a FET.

95. (Previously Presented) The apparatus of claim 86, wherein the transistor is a JFET.

96. (Previously Presented) The apparatus of claim 86, wherein the transistor is a MOSFET.

97. (Currently Amended) An apparatus for down-converting an electromagnetic signal, comprising:

a capacitor having a first and second port; and

a first and second transistor each having a gate, drain and source,

wherein the first port of the capacitor is electrically coupled to one of the drain or source of the first transistor and the second port of the capacitor is electrically coupled to one of the drain or source of the second transistor, and the gate of the first transistor is electrically coupled to the gate of the second transistor,

wherein a control signal is electrically coupled ~~directly~~ to the gate of the first transistor and the gate of the second transistor, and an RF source signal is electrically coupled to the other of the drain or source of the first transistor and the other of the drain or source of the second transistor, and

wherein a value of capacitance for the capacitor is selected based on a frequency of energy transfer pulses, an aperture duration of the transistor, and a resistor value.

98. (Previously Presented) The apparatus of claim 97, further comprising:

a resonant structure having a first and second port,

wherein the first port of the resonant structure is electrically coupled to the other of the drain or source of the first transistor, and the second port of the resonant structure is coupled to the other of the drain or source of the second transistor.

99. (Previously Presented) The apparatus of claim 98, further comprising:

a first and second impedance each having a first and second port,

wherein the first port of the first impedance is electrically coupled to the first port of the resonant structure and the first port of the second impedance is electrically coupled to the second port of the resonant structure, and

wherein the RF source signal is electrically coupled to the second port of the first impedance and the second port of the second impedance.

100. (Currently Amended) The apparatus of claim 97, wherein ~~a~~ the value of capacitance for the capacitor is selected so that the capacitor discharges stored energy to a load when one of the first and second transistors is open.

101. (Currently Amended) The apparatus of claim 97, wherein ~~a~~ the value of capacitance (C_s) for the capacitor is selected ~~based on a frequency (*freqLO*) of~~

~~energy transfer pulses, a duration (*Aperture_Width*) of an aperture of the transistor, and a resistance (*R*)~~ such that

$$C_s(R) = \left(\frac{\frac{1}{freqLO} - Aperture\_Width}{-\ln(0.841) \cdot R} \right)$$

wherein (*freqLO*) is the frequency of energy transfer pulses, (*Aperture_Width*) is the aperture duration of the transistor, and (*R*) is the resistor value.

102. (Previously Presented) The apparatus of claim 97, wherein a duration of an aperture of pulses of the control signal is nominally equal to one-half of a period of the RF source signal.

103. (Previously Presented) The apparatus of claim 97, wherein the first port of the capacitor is electrically coupled to an amplifier.

104. (Previously Presented) The apparatus of claim 97, wherein the first and second ports of the capacitor are electrically coupled to first and second ports of a differential amplifier.

105. (Cancelled)

106. (Previously Presented) The apparatus of claim 97, wherein the first and second transistors are FETs.

107. (Previously Presented) The apparatus of claim 97, wherein the first and second transistors are JFETs.

108. (Previously Presented) The apparatus of claim 97, wherein the first and second transistors are MOSFETs.

109. (Currently Amended) An apparatus for down-converting an electromagnetic signal, comprising:

a first and second capacitor each having a first and second port;

a transistor having a gate, drain and source; and

a load,

wherein the first port of the first capacitor and the first port of the second capacitor are electrically coupled to one of the drain or source of the transistor, the load and the second port of the second capacitor are electrically coupled to the other of the drain or source of the transistor,

wherein a control signal is electrically coupled ~~directly~~ to the gate of the transistor, and an RF source signal is electrically coupled to ~~the first port~~ one of the drain or source of the transistor, and

wherein a value of capacitance for the first capacitor is selected based on a frequency of energy transfer pulses, an aperture duration of the transistor, and a resistor value.

110. (Currently Amended) The apparatus of claim 109, wherein ~~a~~ the value of capacitance for the first capacitor is selected so that the capacitor discharges stored energy to a load when the transistor is open.

111. (Currently Amended) The apparatus of claim 109, wherein ~~a~~ the value of capacitance (C_s) for the first capacitor is selected ~~based on a frequency (*freqLO*)~~

~~of energy transfer pulses, a duration (*Aperture_Width*) of an aperture of the transistor, and a resistance (*R*)~~ such that

$$C_s(R) = \left(\frac{\frac{1}{freqLO} - Aperture\_Width}{-\ln(0.841) \cdot R} \right)$$

wherein (*freqLO*) is the frequency of energy transfer pulses, (*Aperture_Width*) is the aperture duration of the transistor, and (*R*) is the resistor value.

112. (Previously Presented) The apparatus of claim 109, wherein a duration of an aperture of the transistor is nominally equal to one-half of a period of the RF source signal.

113. (Previously Presented) The apparatus of claim 109, wherein the first port of the first capacitor is electrically coupled to an impedance matching network.

114. (Previously Presented) The apparatus of claim 109, wherein the first port of the first capacitor is electrically coupled to an amplifier.

115. (Previously Presented) The apparatus of claim 109, wherein the first port of the second capacitor is electrically coupled to an impedance matching network.

116. (Cancelled)

117. (Previously Presented) The apparatus of claim 109, wherein the transistor is a FET.

118. (Previously Presented) The apparatus of claim 109, wherein the transistor is a JFET.

119. (Previously Presented) The apparatus of claim 109, wherein the transistor is a MOSFET.

120. (New) The apparatus of claim 75, wherein the capacitor discharges stored energy to a load at a controlled discharge rate.

121. (New) The apparatus of claim 86, wherein the first capacitor discharges stored energy to a load at a controlled discharge rate.

122. (New) The apparatus of claim 97, wherein the capacitor discharges stored energy to a load at a controlled discharge rate.

123. (New) The apparatus of claim 109, wherein the first capacitor discharges stored energy to a load at a controlled discharge rate.